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Effect of non-extraction orthodontic treatment of impacted and malposed maxillary canines on upper lip strain and thickness

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Abstract

Introduction: As Orthodontists we encounter ectopic and malposed teeth in our daily practices. Any permanent tooth can be ectopic. The cause may be genetic, environmental or both. Canines are frequently malposed and this can be due to ectopic development. This might lead to an abnormal developmental position. Orthodontic treatment is justified in such cases for both functional as well aesthetic reasons. Current concepts in diagnosis and treatment planning focus on balance and harmony of various facial features. Hence the objective of the present study was to assess changes in soft tissue profile after non extraction orthodontic management of malposed /impacted maxillary canines.

Material and Methods: The study was conducted at Orthodontic Department of Armed forces Institute of Dentistry (AFID). A total of 50 (20 males and 30 females) patients, between the ages of 12 to 19 years comprised the sample. These were selected by non probability convenience sampling technique. After surgical exposure and the alignment of malposed/impacted maxillary canine, changes in lips were ascertained. Data was analyzed by using SPSS version10. The pre and post treatment comparison in both male and female groups was done by applying paired t test.

Results: The result showed positive correlation between Orthodontic treatment and the upper lip strain ($P<0.003$) while no effect on lip thickness. This study showed more changes in females as compared to males.

Conclusions: Orthodontic treatment can bring about changes in a patient's soft tissues and it is paramount to predict future changes. Albeit being a difficult task, it is every clinician's responsibility to inform his/her patients of such changes. Conclusively, it is difficult to measure soft tissue changes accurately and are a matter of subjective opinion.

Keywords: Soft tissue analysis; ectopic canines; non-extraction treatment

Introduction

For centuries, facial esthetics has been a subject of interest to people of all cultures.[1-3]As far as orthodontics is concerned, harmonious facial esthetics and functional occlusion have long been recognized as the two most important goals of orthodontic treatment.

The soft tissue response during treatment, especially that of lips shows different variation regarding lip morphology and strain during hard tissue changes. Thin lips follow the incisor movements more while thick lips may not respond the same way.[4] Oliver demonstrated a significant correlation between incisor changes and vermillion border changes in subjects with high lip strain but insignificant in subjects with low lip strain.[5]

A review of literature indicates that many analyses have been proposed to evaluate and quantify the facial profile. These focus on predictive aspects of the relationship between the incisors and the lips; the goal being to relate changes in incisors position & its impact on lip protrusion.[7-9]

Maxillary canine has the longest period of

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development, the deepest area of development, and the most difficult path of eruption of all the teeth.[10-11] They play a key role in smile design and most commonly require surgical exposure and orthodontic guidance during eruption.[12,18]

Teeth in the dental arches provide a scaffold to the perioral drape of soft tissues. Spatial change of the teeth particularly in the labial segment may effect the lip position. Most of the previous studies have been carried out about the effects of incisors position on soft tissues. Malposed and impacted maxillary canines may have some effect on the soft tissue profile. It would be advantageous for the clinician to be able to predict the expected profile changes before any treatment is initiated. Keeping these rational in mind an attempt was made to assess the effect of orthodontically managed malposed/impacted canine on the perioral soft tissue of the face.

Material and Methods

50 patients with malposed /impacted maxillary canines, who visited Orthodontic department of AFID (Armed forces Institute of Dentistry), Pakistan were selected by using Non-probability convenience sampling technique. Study design was interventional-Quasi experimental. Duration of the study was approximately two years. Patients who had not received any orthodontic treatment previously between the ages of 12-25 years, having class I Dental and Skeletal relationship with transposed/impacted canines were included in the study. Patients with periodontal disease, extracted / missing teeth, history of previous Orthodontic treatment and with any other obvious oral pathology were excluded from the study. Thorough clinical examination, pretreatment lateral cephalogram, OPG, Photographs and dental casts were made for each patient. After orthodontic treatment of approximately two years duration, lateral cephalograms were repeated for all patients. All pre and post treatment cephalograms were taken on the same cephalometric unit to avoid any magnification errors. Each film was traced on an acetate tracing paper and all landmarks were marked. Upper lip thickness was measured by horizontally marking a point on the anterior alveolar plate, 2 mm below point A to the out border of the upper lip. Upper lip strain was measured by extending a horizontal from the vermillion of the upper lip and the labial surface the maxillary center incisor.[13] p value of < 0.05 was taken as significant. Relevant descriptive statistics were reported.

Results

The change in soft tissue profile was measured for 50 cases with malposed &/or impacted canines on pre and post cephalometric radiographs. The average age of the sample was 14.7±1.7 (Figure 2).Means and standard deviations for upper lip thickness and strain were measured (Table I) and a comparison between pre and post treatment was made (Table II).

The mean value for upper lip thickness before treatment was 15.06 ± 2.51 mm and after treatment was 16.02 ± 5.61 mm. For females, lip thickness before treatment was 14.6 ± 1.9 mm and 15.1 ± 2.1 mm while for males, it was 15.9 ± 3.2 mm before and 17.7 ± 2.10 mm after treatment. Upper lip thickness was insignificantly correlated (p-value 0.204) whereas the lip strain had a significant correlation (p-value 0.003).

The mean value for upper lip strain before treatment was 14.63 ± 2.44 mm and after treatment was 12.98 ± 2.37 mm. Pretreatment Upper lip strain values for males and females were 15.2 ± 3.7 mm and 14.2 ± 1.9mm respectively. Post treatment values were 13.0 ± 2.6 mm and 12.9 ± 2.6 mm respectively for either gender.

Table I: Descriptive statistics pre and post treatments upper lip thickness and upper lip strain

		Mean	N	Std. Deviation
Pair 1	Upper lip thickness (pre-treatment)	15.0600	50	2.5125
	Upper lip thickness (post-treatment)	16.0200	50	5.6179
Pair 2	Upper lip strain (pre- treatment)	14.6300	50	2.4416
	Upper lip strain (post- treatment)	12.9800	50	2.3710

Table II: Comparison of pre and post treatment upper lip thickness and upper lip strain

		T	df	Sig. (2-tailed)
Pair 1	Upper lip thickness before treatment Upper lip thickness after treatment	-1.286	49	.204
Pair 2	Upper lip strain before treatment Upper lip strain after treatment	3.158	49	.003

Table III: Descriptive statistics for males and females

		Females		Males	
Sr. no	Measurements	Before treatment mm	After treatment mm	Before Treatment mm	After treatment mm
1	**Upper lip thickness**	14..6(± 1.9) mm	15.1 (±2.1) mm	15.9(± 3.2) mm	17.7(± 2.10) mm
2	**Upper lip strain**	14.2(± 1.9) mm	12.9(± 2.6) mm	15.2(± 3.7) mm	13.0(± 2.6) mm

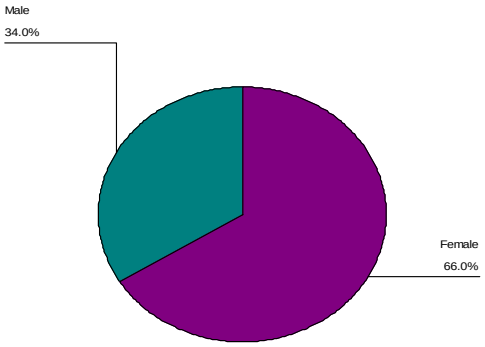

Figure 1

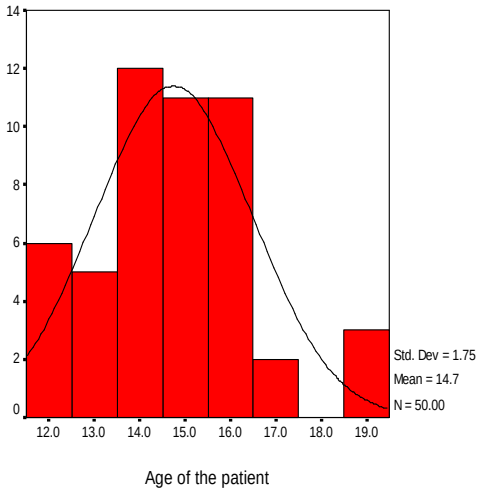

Figure 2: Age distribution

Discussion

The primary aim of this study was to compare the changes in soft tissue profile after Orthodontic management of malposed and impacted maxillary canines. Keeping in mind soft tissue paradigm, the treatment results after orthodontic treatment must reflect accurate soft tissue changes.

In our daily practice, various methods are used to evaluate soft tissue changes on cephalometric radiograph when assessing the success of orthodontic treatment.

Placement of teeth according to the accepted cephalometric criteria does not necessarily ensure that, overlying soft tissues will drape in a harmonious manner. The upper lip strain and thickness were evaluated for the response

of underlying hard tissues. The values for upper lip strain were significantly reduced after treatment (p value .003). There was a significant difference between males and females (Table III). The decrease in the lip strain might be due to decrease tension of upper lip soft tissue after orthodontic correction of malposed and/or impacted maxillary canines. Another factor contributing towards the decrease in upper lip strain might be the growth changes since the patients included in the study were in growing ages. The results are congruent with Kocadereli's[25] observations who reported lip position within the framework of growing nose and chin. The lips drop backwards as the nose and chin grow forward. More over Fida et al also showed positive correlation of lip strain with upper teeth inclination.[19] Maxillary canines are the cornerstone of the dentition and might affect upper lip strain. Peck and Peck[21] concluded that maxillary sulcus contour and mandibular sulcus contour are gently curved and can dictate lip strain. This was relevant to the hypothesis of this study. Values for upper lip thickness changed from 15 ± 25 mm to 16.02 ± 5.6 mm. Comparing the changes in lip thickness, results were more significant for females ($P < 0.079$ than males ($P < 0.409$). These results agree with previous studies by Baum[20] and Oliver[5] indicating that soft tissues show changes which are different between the two genders. Current study shows insignificant correlation of upper lip thickness with alignment of buccally malposed and impacted maxillary canines (Table II). Literature reports divergent results and views on effects of dental and skeletal retraction effects on changes in the soft tissue.[22,23,24] Despite the high correlation between soft tissues and osseous changes, the differing results suggested in the literature for these changes might be explained by the introduction of the factors of lip thickness and lip strain.

Conclusions

Soft tissue animation quantification is a complex process. After orthodontic treatment, profile changes are mostly positive when the end result is kept in mind but the variation in these changes due to the growth of nose and chin cannot be accounted for with accuracy. As orthodontists, it is paramount to counsel the patient with this uncertainty. The overall esthetic results of these changes are to a certain extent a matter of subjective opinion.

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